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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,242	10/16/2003	Richard D. Breault	C-3144	9404

7590 07/23/2007

Malcolm J. Chisholm, Jr.
220 Main Street
P.O. Box 278
Lee, MA 01238

EXAMINER	
WANG, EUGENIA	
ART UNIT	**PAPER NUMBER**
1745	
MAIL DATE	**DELIVERY MODE**
07/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/687,242	BREAULT ET AL.
	Examiner	Art Unit
	Eugenia Wang	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 6/15/07.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-6,8-15 and 17-25 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6, 8-15, 17-25 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment filed June 18, 2007:

a. Claims 1-6, 8-15, and 17-25 are still pending.

b. The previous claim objections have been withdrawn in light of the amendment.

c. The declaration filed June 15, 2007 has been acknowledged and will be fully addressed within the body of the rejection.

d. The prior rejection is maintained, thus this action is final.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-3, 8-15, and 17-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6764786 (Morrow et al.) as evidence by "ZIRCAR Ceramics: ZAL-45 & ZAL-45AA" and <u>Handbook of Fuel Cells</u>.

Regarding claims 1, 22, and 25, Morrow et al. teaches a fuel cell stack [12] and power plant comprising a defined reaction portion [14] (column 4, lines 26-28). A component plate [16] is secured at the end of the reaction portion (column 4, lines 41-46). Additionally, Morrow et al. teaches a graphite current collector [24] that is electrically connected with the end cell (column 4, lines 66-68; column 5, lines 1-6). A desired electrical conductivity for the current collector, 25 siemens/centimeter or greater, is mentioned (column 4, lines 62-64). Although conductivity is not mentioned in the claim, electrical resistivity is mentioned. However, it would be obvious to one having ordinary skill in the art to know that conductivity is the inverse of resistivity. A simple conversion, shows that the desired conductivity of the claimed current collector falls within the range that Morrow et al. teaches.

$$resistivity = \frac{1}{conductivity}$$
$$at\_Claim's\_boundary:$$
$$resistivity = 100\_mircro - ohm\_cm$$
$$conductivity = \frac{1}{100\_micro - ohm\_cm}$$
$$conductivity = \frac{1}{100 * 10^{-6}\_ohm\_cm}$$
$$conductivity = 10000\_siemens / cm \geq 25\_siemens / cm$$

In one embodiment, Morrow et al. also teaches an embodiment of their current collector, which includes a thin, highly conductive metal layer [39], for example copper, next to it (col. 5, lines 44-62; fig. 1). This thin, conductive metal layer [39] is said to be less than 2 mm thick (col. 5, lines 55-62), and it can be taken that this thin metal layer can be interpreted as a current collector itself. Because of the recitation of the high conductivity, it would be inherent that this metal layer [39] would have a conductivity as high, or even higher than the current collector [24]. Morrow et al. also teaches an insulator [36], which is placed next to the current collector (column 5, lines 27-28). Further regarding the insulator, Morrow et al. teaches its purpose, which is restricting of heat from the fuel stack though the current collectors (column 5, lines 35-38). Therefore, it is inherent that total heat transfer rate across the insulator from the end cell being no greater than the heat generated by the end cell. Morrow et al. also teaches pressure plate [40], which is secured adjacent to the thermal insulator [36], which has the cross sectional area at least as large as the end cell component plate (column 5, lines 62-67). Additionally, the fuel cell apparatus above inherently includes a method of making and operating (as applied to claim 25). Morrow et al. teaches that the fuel cell

has reactant manifolds [44, 46] secured to reaction portion [14] for directing the reactant streams into the fuel cell stack [10] (col. 6, lines 31-40) (as applied to claim 25).

Morrow et al. does not expressly disclose that (a) the current collector is thinner than 1 mm, (b) the insulator is thinner than 20 mm, (c) the thermal conductivity of the insulator is less than 0.100 W/mK, or (d) that the method would rapidly warm the fuel cell (as required by claim 25). However, the evidence and explanations below will obviate the aforementioned properties.

With regards to (a), as stated above the thin, conductive metal layer [39], said to be less than 2 mm thick (col. 5, lines 55-62), can be taken that this thin metal layer can be interpreted as a current collector itself. In can be reasonably stated that 2 mm or less would teach 1 mm or less, as the incremental decrease from 2 mm would be to 1 mm. Alternately, it can be interpreted that less than 2 mm does not fully encompass 1 mm or less, as required by claims 1, 22, and 25. If using this interpretation - it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a <u>prima facie</u> rejection is properly established when the difference in the range or value is minor. <u>Titanium Metals Corp. of Am. v. Banner</u>, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art <u>unless</u> there is evidence indicating such ranges is critical. <u>In re Boesch</u>, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). <u>In re Aller</u>, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). <u>In re Hoeschele</u>, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

With regards to (b), Morrow et al. does not specifically mention the insulator [36] thickness. Although the figure is not drawn to scale, it is reasonable to say that insulator [36] would be less than the claimed 20 mm. This conclusion can be drawn since the metal layer [39] has been defined to be less than 2 mm thick (col. 5, lines 55-62) and the current collector [24] is defined to be 3-12 mm (col. 4, lines 60-65), and the combined width of [24] and [39] is approximately that of insulator [36], giving a range between 5-14 mm. The figure is not taken to be completely to scale, however, it does give a rough idea of size proportions. The shown metal strip [39] and collector [24] a similar thickness to the insulator layer. Given the teaching of the combination of [39] and [24] would be less than 14 mm, the adjacent insulator would proportionally have a thickness about that much, thus obviating a thickness 20mm or less for said insulator.

As to (c), although the insulator's thermal conductivity is not disclosed, Morrow et al. mentions that the use of "ZAL-45 alumina insulation" material (column 5; lines 41-44). This insulator's thermal conductivities can be found in the Characteristics & Properties section of evidentiary piece "ZIRCAR Ceramics: ZAL-45 & ZAL-45AA" and can be seen to be dependent on the environmental temperature. Therefore, if the running temperature of the fuel cell stack is lower than 250°C, than the thermal conductivity can be expected to be lower than 0.16 W/mK. Morrow et al.'s fuel cell stack seems to be drawn most specifically to a proton exchange membrane (PEM) fuel cell, as the improvement is referenced to it in the Background of the Invention (col. 2, lines 15-50). It is evidenced by the Handbook of Fuel Cells that a PEM stack runs at 80°C (p 1-32, para 2, lines 7-10). The thermal conductivity would inherently be lower

than .16 W/mK, however, the exact number cannot be extrapolated. However, it the value would be close to that of the claimed 0.100 W/mK or less. It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (In re Woodruff, 16 USPQ2d 1935,1937 (Fed. Cir. 1990))

As to (d), Morrow et al. does not specifically mention the warming of the cell. However, if the fuel cell structure above is taught or obviated by Morrow et al., it would operate in such a method that would inherently warm up the cell as required by claim 25 of the instant application.

Regarding claims 2-3, Morrow et al. does not specifically mention that the sensible heat of the current collector is no greater than 50% greater than the sensible heat of the end cell (as required by claim 2), more specifically no greater than 25% greater than the sensible heat of the end cell (as required by claim 3). However, Morrow et al. teaches the fact that the thickness of the metal current collector with

certain desired properties is dependant on the material it is made of (column 5, lines 56-61). Sensible heat is one of these inherent properties of a material, given a specific thickness. Therefore, a copper metal strip [39] acting as a current collector plate would inherently have the property where the sensible heat of the current collector is no greater than 50% greater than the sensible heat of the end cell (as applied to claim 2), more specifically no greater than 25% greater than the sensible heat of the end cell (as applied to claim 3).

As to claim 8, insulator [36] can be viewed in comparison to the combination metal layer [39] and collector [24]. Although the figure is not drawn to scale, it is reasonable to say that insulator [36] would be less than the claimed 10 mm. This conclusion can be drawn since the metal layer [39] has been defined to be less than 2 mm thick (col. 5, lines 55-62) and the current collector [24] is defined to be 3-12 mm (col. 4, lines 60-65), and the combined width of [24] and [39] is approximately that of insulator [36], giving a range between 5-14 mm. Using the figure for a rough idea of size proportions. The shown metal strip [39] and collector [24] a similar thickness to the insulator layer. Given the teaching of the combination of [39] and [24] would be between 5-14 mm, thus if not teaching the 10 mm or less by inclusion, at least obviating the claimed range of 10 mm or less, as it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a <u>prima facie</u> rejection is properly established when the difference in the range or value is minor. <u>Titanium Metals Corp. of Am. v. Banner</u>, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support

the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

As to claims 9 and 10, Morrow et al. does not specifically mention that the insulator has a total heat rate of transfer across the insulator from the end cell of less than 50% generated by the end cell (as required by claim 9) and less than 25% generated by the end cell (as required by claim 10). However, the insulator has the purpose of keeping heat from transferring between the end cell and current collector, thus the heat lessened transfer would definitely be less than 100%. However effectiveness of an insulator is an inherent property of thickness and material used. As the alumina material used by Morrow et al. has fit the previously defined characteristics for the insulator, it would be inherent that the heat transfer across the insulator would be less than 50% and even 25% of the heat generated by the end cell (as applied to claims 9 and 10, respectively).

As to claim 11, Morrow et al. teaches that heavy dense metals have been used to construct the pressure plates (column 2, lines 36-38).

Regarding claim 12, Morrow et al. teaches a pressure plate that is made of an electrically non-conductive, non-metallic, fiber reinforced composite material (column 6, lines 7-10).

Regarding claim 13, Morrow et al.'s teach has a current collector, metal strip [39] that extends along the long side of the fuel cell stack that is adjacent to the pressure

plate [40], where the metal strip [39] (interpreted as the current collector) is connected to conductive studs [28, 30] (see fig. 1). Another current collector [26] is connected to conductive studs [32, 34]. The conductive studs [28, 30, 32, 34] conduct the electricity (col. 5, lines 18-24). Although the thin metal strip [39] (interpreted as a current collector) is shown as being placed next to one carbon collector [24] and not the other [26], it would have been obvious to one having ordinary skill in the art at the time the invention was made to duplicate the metal strip [39] to be placed on the other side, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.,* 193 USPQ 8.

Regarding claim 14, the interpretation using the thin metal strip [39] as the current collector is applied (see claim 1 rejection). Morrow et al. teaches the use of a thin, metal layer as a current collector (column 5, lines 50-51). Foil is defined as being metal in the form of thin, flexible leafs or sheets (*The American Heritage® Dictionary of the English Language, Fourth Edition*. Houghton Mifflin Company, 2004. 28 Aug. 2006. <Dictionary.com http://dictionary.reference.com/search?q=foil>). A thin metal layer fits the definition of a foil.

As to claim 15, the interpretation using the thin metal strip [39] as the current collector is applied (see claim 1 rejection). Looking at Morrow et al.'s fig. 1, it is clear that the metal strip [39] (serving as the current collector) serves as a metal coating on insulator [36].

As to claims 17 and 18, Morrow et al. teaches a thin, conductive metal layer [39], said to be less than 2 mm thick (col. 5, lines 55-62), which can be taken that this thin

metal layer can be interpreted as a current collector itself. Additionally, it is taught that more recent current collectors are thinner than previous ones (column 5, lines 56-57).

Morrow et al. does not specifically teach that the current collector is no greater than 0.50 mm thick (as required by claim 17), or more specifically that it is not greater than 0.25 mm thick (as required by claim 18). However, it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (In re Woodruff, 16 USPQ2d 1935,1937 (Fed. Cir. 1990))

As to claims 19-20, Morrow et al. teaches a graphite current collector [24] with a desired electrical conductivity of 25 siemens/centimeter or greater (column 4, lines 62-64). However, in one embodiment, Morrow et al. also teaches an embodiment of a current collector that includes a thin, highly conductive metal layer [39], for example copper, next to it (col. 5, lines 44-62; fig. 1). This thin, conductive metal layer [39] can be interpreted as a current collector itself. Because of the recitation of the high

conductivity, it would be inherent that this metal layer [39] would have a conductivity as high, or even higher than the current collector [24]. See below calculations of resistivity to conductivity.

*Boundary of claim 19 applied:

$$resistivity = \frac{1}{conductivity}$$
$$at\_Claim's\_boundary:$$
$$resistivity = 50\_mircro - ohm\_cm$$
$$conductivity = \frac{1}{50\_micro - ohm\_cm}$$
$$conductivity = \frac{1}{50 * 10^{-6}\_ohm\_cm}$$
$$conductivity = 20000\_siemens/cm \geq 25\_siemens/cm$$

*Boundary of claim 20 applied:

$$resistivity = \frac{1}{conductivity}$$
$$at\_Claim's\_boundary:$$
$$resistivity = 25\_mircro - ohm\_cm$$
$$conductivity = \frac{1}{25\_micro - ohm\_cm}$$
$$conductivity = \frac{1}{25 * 10^{-6}\_ohm\_cm}$$
$$conductivity = 40000\_siemens/cm \geq 25\_siemens/cm$$

As to claim 21, Morrow et al. teaches that the metal strip [39], serving as the current collector, is exemplified by the material copper (col. 5, lines 45-55).

As to claims 23 and 24, the recitation of loads (transportation device and stationary device, as required by claims 23 and 24, respectively), the structure of Morrow et al. can be used for such external loads.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

As applied to the apparatus claims.

3. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrow et al., ZIRCAR, and The Handbook of Fuel Cells, as applied to claim 1, in further view of "Thermal Properties of Silica Aerogels."

As to claims 4-6, Morrow et al.'s insulation material (as evidenced by ZIRCAR) teaches that the thermal conductivity of Morrow et al.'s material reasonably is held to be below 0.16 W/mK.

Morrow et al. does not teach that the thermal conductivity is no greater than 0.005 W/mK (as required by claim 4), no greater than 0.010 W/mK with a compressive strength in excess of 350 kPa (as required by claim 5), no greater than 0.005 W/mK with a compressive strength in excess of 350 kPa in a vacuum (as required by claim 6).

"Thermal Properties of Silica Aerogels" teaches that silica aerogels have very low thermal conductivity (as applied to claims 4-6), a property of low thermal conductivity can be decreased even more under vacuum (as applied to claim 6) (p1, para 001). Additionally, "Thermal Properties of Silica Aerogels" cites a particular silica aerogel that is used in a carbon composite that has a thermal conductivity that is as low as approximately 0.0042 w/mK (p3, para 004, fig. 2) (as applied to claims 4-6). Although compressive strength is not specifically mentioned, this property is inherent to the material of the insulator, therefore the silica aerogel composite would inherently have the compressive strength of an excess of 350kPa (as required by claims 4 and 5). Additionally, it is said that the carbon addition to the silica aerogel adds mechanical strength (in addition to lowering thermal conductivity, as seen above) (p3, para 004). The motivation for using the silica aerogels composite is that silica aerogels have been found to be an environmentally friendly insulator (p1, para 001). Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the silica aerogel composite as the insulator for the fuel cell stack, since it

has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416.

4. Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrow et al., ZIRCAR, Handbook of Fuel Cells (as applied to claim 22) in further view of US 2003/01244114 (Hertel et al.).

Claims 23-24 were previously rejected above, where the load was not given patentable weight. However, an alternate rejection can be made if the loads were given patentable weight.

As to claims 23-24, none of the aforementioned pieces teach the specific loads of transportation drive systems (as required by claim 23) and stationary devices (as required by claim 24).

However Hertel et al. teach that fuel cells, using PEM as example, are well-known and are commonly used to produce electrical energy to power to be used in transportation vehicles, portable power plants, and stationary power plants (as applied to claim 22-24) (para 0001-0002). The motivation for using fuel cell-generated electricity for both stationary loads and transportation vehicles is that fuel cell generated electricity is more environmentally friendly. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use electricity generated by a fuel cell assembly stack in a power plant whose electrical energy was to be used in transportation and stationary applications in order to reduce pollution.

Response to Arguments

5. Applicant's arguments filed June 15, 2007 have been fully considered but they are not persuasive.

As to claims 1, 22, and 25:

Applicant argues that examiner does not address the limit that the current collector has a sensible heat less than a sensible heat of the end cell. Applicant rebuts Examiner's position taken with the second office action (p18) and argues that within the Declaration that the sensible heat depends on both specific heat ad a design feature of the mass of an object, more specifically width*height*thickness*density.

Examiner respectfully disagrees and upholds the position. As stated on the previous office action, the thickness of the current collector can be made out of the same material (p11, lines 3-10 of the spec cite copper as a material for the current collector, much like [39] of Morrow et al.). Therefore the density and specific heat are the same for this embodiment. The thickness has been previously obviated within the office action (as Morrow et al. teaches the layer to be less than 2 mm thick, which reasonably obviates, if not clearly teaches, the 1 mm thick or less, claimed by the instant application). The width*height aspect is merely a measurement per unit area of the fuel cell. With the thickness (the ultimate "design feature") and the material being the same, if the same plate of Morrow et al. were used in that of the instant application, the sensible heat would be the same, too, as the unit area would be a function of the fuel cell assembly.

Applicant also argues that the application of inherency is improper (with respect to the sensible heat argument listed above).

Examiner's position is that Morrow's plate and that of the instant application would yield the same properties if used in the same fuel cell. This is because the materials are the same (thus the specific heat and the density would be the same), and the thickness of 2 mm or less has been taught (which reasonably suggests, if not clearly teaches of at least the thickness of 1mm, the upper limit of the instant application), thereby cover an identically and substantially overlapping range. Therefore, if the plate were used in the same fuel cell stack, the unit area would be the same (this is because for a given fuel cell stack, the end cell and the current collector placed next to it would have the same unit area). Therefore, the invention of Morrow et al. would have the same expected characteristics with respect to sensible heat (thus rendering it in the least obvious, if not inherent).

Applicant points to fact Morrow et al. teaches an embodiment that teaches the use of stainless steel as the current collector and fig. 5 of the instant application, to show a sensible heat in excess of 110%. In this manner, Applicant says that Morrow et al. does not teach the required limitation of sensible heat.

Examiner responds in saying that stainless steel is not the only material embodied. As previously mentioned, copper is embodied. In fig. 5 of the instant application, copper has a sensible heat within the range claimed by applicant. Since this embodiment of Morrow et al. fits that of the instant application, it still teaches what applicant is claiming. Again, Examiner would like to point out that for a given fuel cell,

the "design variable" of the collector lies in the thickness, a range that Morrow et al. at the least obviates with a teaching of 2 mm or less (if not clearly/reasonably teaches of the upper range of that of the instant application, which is 1mm or less).

Applicant argues that that the dimensional limitations of the present claim cannot be measured in isolation against other known thickness, because the claimed dimensions of the current collector are in association with the sensible heat, which in turn is a value dependent on the sensible heat of the end cell.

Examiner respectfully disagrees. Both Morrow et al. and the instant application claim a fuel cell stack. As mentioned previously, the plate of Morrow et al. teach the same materials used and further teaches a substantially identical thickness (less than 2mm, instead of 1 mm or less, as claimed by the instant application). Within the same fuel cell stack, the invention of Morrow et al. would still behave the same as that of the instant application, because the same fuel cell stack would have an end cell with the same sensible heat.

Applicant again argues that the use of inherency is improper, because the Examiner has not specifically pointed to the portion of the prior art that requires the claimed structural characteristics of the current collector wherein the sensible heat of the current collector must be less than a sensible heat of the end cell (12).

Examiner would like to clarify the position taken with respect to inherency. The characteristics claimed are inherent, wherein the inherency was shown via reasonable deduction. As listed by Applicant, sensible heat is dependent on specific heat and the mass (width*height*thickness*density). As previously stated, the density and specific

heat would be the same for the same material. For the same fuel cell stack, the unit area (width*height) would be the same. The thickness range has been obviated by Morrow et al. within the rejection. Therefore, the inherency rejection of Morrow et al. with respect to the current collector characteristics is proper, via the deduction laid out above.

Applicant argues that as with the sensible heat, the determination of thermal conductivity and thickness must be compared to the measured heat generated by the end cell and that Morrow et al. does not require such a comparison. Therefore, Applicant draws the conclusion that the properties are not inherent.

Examiner would again like to assert the position that with the material used and a thickness of 2 mm or less has been taught by Morrow et al.. Note that a 2 mm or less thickness clearly teaches at least the upper limit of the instant application (1 mm) and thus covers substantially the same range (1 mm or less). As previously stated, within the same fuel cell stack, the invention of Morrow et al. would still behave the same as that of the instant application. Therefore, the invention of Morrow et al. would have the same characteristic with respect to thermal conductivity, unless shown otherwise.

Applicant points to the Declaration to argue Examiner's statement that "the insulator cannot transmit more heat than generated by the end cell, as it does not generate heat itself to transfer" (p 19 of the second office action).

Examiner would like to point out that the Declarant uses terms like "the typical fuel cell stack *may contain* several hundred fuel cells" and that "a total rate of heat transfer across an insulator *could be* greater than the heat generated by an end cell of

such a fuel cell stack" (p 16-17). However, this argument is not compelling, because it lists possibilities, and does not provide evidence to positively refute Examiner's position.

For further comments on the Declaration, please see the response to Declaration, listed below.

Response to the Declaration

6. The Declaration filed June 15, 2007 has have been fully considered but is not persuasive.

With respect to the Declaration, the responses to the arguments, as made above can be applied. However, further responses are listed below.

Paragraph 5 of the Declaration gives scientific background and asserts the limitations of the claims.

Paragraph 6 of the Declaration argues the specific, claimed characteristics of the thermal conductivity and thickness are neither shown nor suggested singly or standing alone, or in combination with each other, as in the independent claims of the above reference application.

Examiner would like to state the position that this argument is with out basis, as it provides no reasoning to support this assertion.

Paragraph 7 of the Declaration argues against Examiner's assertion "the insulator cannot transmit more heat than generated by the end cell, as it does not generate heat itself to transfer" (p 19 of the second office action, as incorporated into the argument section). The Declaration points to the specification that discusses (a) a "bootstrap" start up, where the interior cells rise in temperature more quickly than the

end cell, (b) that a typical fuel cell stack may contain several hundred fuel cells (and so during a "bootstrap" start up, the temperature in the center of the stack increases more quickly than that of the end cells), and (c) consequently the total rate of heat transfer across an insulator could be greater than the heat generated by an end cell of such a fuel cell stack.

Examiner will readdress this argument for clarity's sake. The issues of using broad language that merely lists possibilities, as addressed in the Response to Arguments, still exists (especially with respect to "may contain" and "could be greater"). Furthermore, with respect to (a), Examiner points out that this is only one possible start up process. With respect to apparatuses, the importance lies with whether the prior art apparatus of Morrow et al. meets the same characteristics, not with a single method for operating the apparatus. Furthermore, no evidence is presented that this is the only method to start a fuel cell. With respect to (b), the fuel cell stack is not limited to that which contains several hundred fuel cells. With respect to (c), there is not proof given that the heat across insulator is greater positively greater than that generated by an end of the fuel cell, especially with respect to all of the processes of the fuel cell. Therefore all of the possibilities listed within this particular argument are merely possibilities and are thus not persuasive, since no clear, conclusive evidence is given to support Applicant's position.

Paragraph 8 of the Declaration recites Examiner's previous position on inherency, while paragraph 9 argues against Examiner's position by stating that

sensible heat (of the current collector) depends on both specific heat ad a design feature of the mass of an object, more specifically width*height*thickness*density

Examiner will readdress this argument for clarity's sake. As stated on the previous office action, the thickness of the current collector can be made out of the same material (p11, lines 3-10 of the spec cite copper as a material for the current collector, much like [39] of Morrow et al.). Therefore the density and specific heat are the same for this embodiment, since these are material characteristics. The thickness Morrow et al. teaches is less than 2 mm thick, which at least obviates, if not clearly teaches at least the upper limit of the 1 mm thick or less thickness, which is claimed by the instant application. The width*height aspect is merely a measurement per unit area of the fuel cell. As previously stated, for a given fuel cell stack, the unit area of the end cell and the current collector is identical, since they are placed on top of each other in the stack. Therefore, the invention of Morrow et al. would be expected to provide the same characteristic with respect to sensible heat, as claimed by the instant application.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugenia Wang whose telephone number is 571-272-4942. The examiner can normally be reached on 8 - 4:30 Mon. - Fri., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EW

GREGG CANTELMO
PRIMARY EXAMINER

Gregg Cantelmo
19 July 2007